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ABSTRACT

Results of a survey of time spent by full-time science and engineering faculty on professional activity over an entire 52-week year are reported. The nationwide survey sample was designed to be statistically representative of faculty working full-time in 20 fields of science or engineering. Each surveyed person was asked to complete a log-diary for seven consecutive days. For this report, the 20 fields have been combined into 7 major field groups. The activities reported are for faculty, assistant professor or higher in rank, in doctorate-granting institutions during the 12 months beginning November 1, 1978. Results indicate, among other findings, that faculty work an average 48 hours per week and devote one-third of their time to research, one-third to instructional activities, and one-tenth to outside income-producing activities. A later complete report will include faculty at bachelor's- and master's-degree level institutions. (Author/DC)

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SCIENCE RESOURCES STUDIES HIGHLIGHTS

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University S/E Faculty Spend One-Third of Professional Time in Research

This Highlights reports the results of a survey of time spent by full-time science and engineering (S/E) faculty on professional activity over an entire 52-week year. The nationwide survey sample was designed to be statistically representative of faculty working full-time in 20 fields of science or engineering. Each surveyed person was asked to complete a log-diary for seven consecutive days. For this report, the 20 fields have been combined into 7 major field groups. The activities reported here are for faculty, assistant professor or higher in rank, in doctorate-granting institutions during the 12 months beginning November 1, 1978. A later complete report will include faculty at bachelor's- and master's-degree level institutions.

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Highlights

- Full-time S/E faculty at doctorate-granting institutions devoted an average of 48 hours per week to professional activities. Average workweeks ranged from 48 to 51 hours for engineers and for physical, life, social, and environmental scientists. Mathematical scientists averaged about 41 hours per week.
- For all the surveyed S/E fields combined, faculty spent about one-third of their professional time on research activities. Three-fifths of the total research time was federally sponsored, one-fourth was nonsponsored, and the remainder was sponsored by non-Federal sources.
- Instructional activities accounted for about one-third of the average workweek. Faculty spent twice as much time in preparing for class, grading papers, and similar activities as was spent with students in classrooms and laboratories.
- Activities that produce income from sources other than the institutions at which faculty are employed took up about one-tenth of the professional time of engineers and social scientists. The comparable proportion was 4 percent for environmental scientists. Life and physical scientists spent between 7 percent and 8 percent of their workweek earning outside income.

Introduction

The survey results summarized in this report reflect a first-time effort to gain a comprehensive, quantitative understanding of how S/E faculty spend their professional time. In addition to new information on aculty research, particularly the amount of time devoted to nonsponsored research, the survey provides information on other faculty activities including instruction, administration, and consulting.

Faculty research activities have frequently been the subject of national surveys. Some of these have collected information on staff full-time-equivalents (FTE's) in university and college research. These FTE estimates, however, are often based on sponsored research and thus omit research that is not separately budgeted. Other surveys ask chairmen to estimate the extent of research of faculty in their departments; but there is no way to check the accuracy of the chairmen's estimates short of examining the activities of individual faculty, a very major undertaking. Still other national surveys collect data on the primary work activity of faculty, including research, instruction, and administration. Such measures provide limited information about the actual extent of research because of the varying levels of effort that can qualify as "primary." In addition, both the primary work activity and the FTE surveys usually employ an "as of" date for reporting which means that the data represent a specific time period and, because of seasonal factors, may not be representative of the entire year.

This survey was constructed to avoid the shortcomings of other national studies. The survey requested information on both sponsored and unsponsored research and the individual faculty member reported his or her own activities, including nonresearch work, in hours per day. Furthermore, the survey spread the sampled faculty evenly over a 12-month period so that their responses would be representative of an entire year, not just during periods when classes were being held. This full-year coverage distinguishes this survey from others that are based on a "typical" academic week. Such surveys generally gather data during weeks in which respondents work every weekday and, therefore, tend to find higher averages for hours worked per week than did this study.[1]

Average Hours Worked Per Week

During the entire 12-month survey period, full-time S/E faculty in all surveyed fields devoted an average

[1] For example, averages of total time worked per week would be about 3 hours higher.

(Prepared in the Supply and Education Analysis Group, Division of Science Resources Studies)

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of 48 hours per week to professional activities (table 1). Engineers and physical, life, social, and environmental scientists[2] all recorded workweeks near this level. In contrast, mathematical scientists and psychologists averaged around 40 hours per week. The large standard deviation for psychologists, however, casts some doubt upon whether psychology faculty actually work fewer hours per week than do other S/E faculty.[3] Faculty in psychology and the mathematical sciences spend fewer hours per week in research than do their S/E colleagues (excluding social scientists). This may be the consequence of less federally supported research time than is found in many other fields. Furthermore, mathematical scientists may report fewer hours in research because their activities do not generally require laboratory experiments.

Table 1. Average number of hours spent in professional activities per week by faculty at doctorate-granting institutions: 1978/79

Field	Mean	Standard deviation
All fields	48	0.3
Engineering	49	.9
Environmental sciences	50	4.2
Life sciences	51	.9
Mathematical sciences	41	1.5
Physical sciences	50	4.6
Psychology	39	9.7
Social sciences	48	3.2

SOURCE: National Science Foundation.

During the summer, average workweeks fell by about 13 hours. In part, the lower summer average resulted from more days of leisure during the traditional vacation period. In the summer, about 1 in 6 weekdays had *no* recorded professional activity as compared to only 1 in 23 during the remainder of the year. The survey results also indicated that, for those days in which work occurred, fewer hours were worked per day in the summer.

Faculty Research

Survey results showed that "research and research-related activities" took up about one-third of faculty time for all surveyed S/E fields combined at doctorate-granting institutions (chart 1). Life and physical scientists all devoted more than average shares of their professional time to research. Faculty in psychology and the mathematical and social sciences had less than average shares in research.

The average for hours in research per week was about 15 percent lower in the summer than during the entire year. Most of the drop in total weekly research activity during the summer may be explained by many faculty being on vacation during the week in which they completed their log-diaries. Hours spent on federally sponsored projects were, however, not significantly different by season because many Federal research awards pay for summer research.

The Federal Government was the primary sponsor of S/E faculty research. It supported 60 percent of research time as compared to 14 percent by other sponsors and 26 percent that was nonsponsored—and not separately budgeted (table 2). The relative importance of Federal support of sponsored research is also reflected in funding data. Roughly two-thirds of the R&D expenditures at doctorate-granting institutions are provided by the Federal Government.[4] In comparison, roughly four-fifths of faculty time spent on sponsored research is supported by the Federal Government.

Federal support was proportionately largest in engineering and the physical and life sciences, accounting for about seven-tenths of total research time in those fields. This source was least significant for mathematical and social scientists and psychologists for whom one-half to two-thirds of faculty research time was nonsponsored. The large share of time represented by nonsponsored research in these fields implies that measures of faculty effort based only on separately budgeted activities may substantially understate total research time.

Faculty Instructional Activities

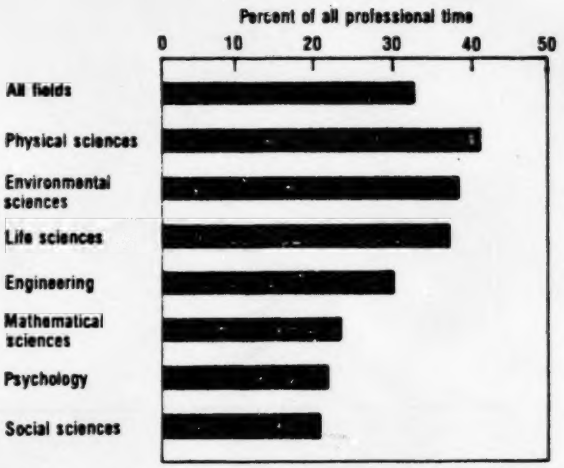
S/E faculty spent about one-third of their professional time on "instruction and instruction-related ac-

[2] For convenience in presentation environmental scientists are defined to include earth and marine scientists.

[3] Unless otherwise noted, differences in activities by field cited in the text are statistically significant at a level of at least 0.05.

[4] National Science Foundation. *Academic Science: R&D Fund, Fiscal Year 1979* (Detailed Statistical Tables) (NSF 81-301), table B-5 (Washington, D.C., 1981).

Chart 1. Allocation of professional time to research activities by faculty at doctorate-granting institutions: 1978/79



NOTE: Caution should be observed in comparing percentages by field. The statistical significance of the difference between two percentages depends upon both the value of the percentages and their associated standard errors. In this chart as well as in the following charts standard errors do not exceed one-sixth of the value of the percentages and in most cases are much less.

SOURCE: National Science Foundation.

Table 2. Research time of faculty in doctorate-granting institutions by source of support: 1978/79
[Percents]

Source of support	Fields							
	All science/ engineering fields	Physical sciences	Mathematical sciences	Psychology	Engineering	Life sciences	Social sciences	Environmental sciences
Federal Government	60	70	34	36	69	72	20	59
Non-Federal sponsors	14	8	6	11	15	15	16	25
Nonsponsored	26	22	59	53	16	13	64	16
(Mean hours per week in research)	**(16)**	**(21)**	**(10)**	**(9)**	**(15)**	**(19)**	**(11)**	**(19)**

NOTE: Detail may not add to 100 percent because of rounding.
SOURCE: National Science Foundation.

tivities" (chart 2). In the mathematical sciences, psychology, and the social sciences, instructional activities occupied the largest fraction of faculty time.

Less than one-third of instructional time was "actual classroom and laboratory contact time" with students. During the summer, classroom and laboratory contact decreased by about one-third from the annual average. The remaining instructional time—which included grading papers, advising students, planning classes, and related tasks—represents, in a sense, the support activities required for teaching. Accordingly, when the latter fell sharply in the summer, these other instructional activities decreased proportionately.

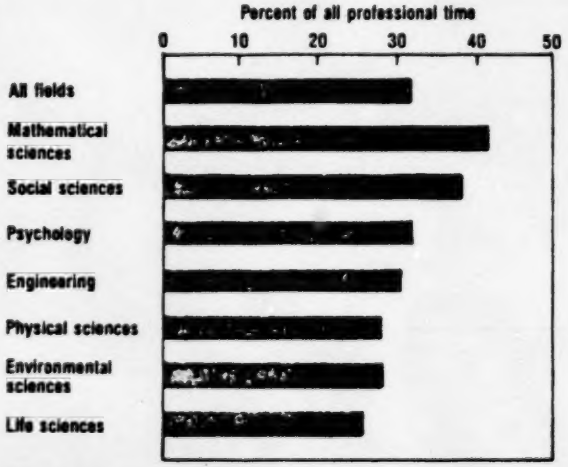
Outside Income-Producing Activities

Many faculty members supplement their academic salaries through outside activities. Although faculty have traditionally engaged in such activities, such supplementary income may have become more important because of the declining purchasing power of academic salaries.[3] Full-time faculty in all surveyed S/E fields at doctorate-granting institutions reported an average 9 percent of their professional time earning outside income (chart 3). Engineers—particularly mechanical and electrical—and psychologists were the most actively involved in outside income-producing activities. Environmental sciences reported the lowest level of such activities (only 4 percent of all work time).

The survey gathered information on the three major types of outside income-producing activities: authoring publications, consulting, and the residual "other outside." The first, which was restricted to writing for compensation, comprised over one-half of the hours reported in this category. Consulting took up another three-tenths.

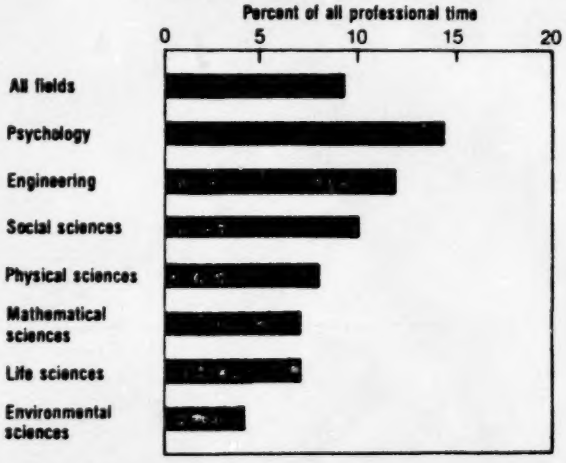
[3] According to the American Association of University Professors, *Academe: Bulletin of the AAUP*, salaries for faculty in all fields, including science and engineering and nonscience/engineering fell in real terms by 18 percent between 1969 and 1979 (Washington, D.C., September 1980).

Chart 2. Allocation of professional time to instructional activities by faculty at doctorate-granting institutions: 1978/79



SOURCE: National Science Foundation.

Chart 3. Allocation of professional time to outside income-producing activities by faculty at doctorate-granting institutions: 1978/79



SOURCE: National Science Foundation.

Public Service, Administration, and Professional Activities

For all seven fields combined, about one-fifth of professional time fell into the broad category "Public Service, Administration, and Professional Activities." Over one-half consisted of "time spent on department or institutional administration; committees; and other miscellaneous institutional activities." Not surprisingly, time allocated to such responsibilities was greater for senior faculty ranks and was greater during the fall and spring terms than in the summer.

The second largest component, about one-fourth, of this broad category consisted of activities related to membership in professional organizations, refereeing for journals, and similar functions. The third component, public service, which accounted for one-sixth of this category, was limited in this survey to professional activities that produced no additional income beyond expenses. Physical scientists were at the lower end of the share of time spent in public service per week, and life and environmental scientists were at the upper end.

Professional Development

In order to maintain their professional skills and to learn about current investigations in their fields, S/E faculty read journals and attend workshops, seminars, and special courses. S/E faculty averaged about 8 percent of weekly professional time in such pursuits. The share of work time in professional development ranged from about 13 percent (social scientists) to 6 percent (engineers).

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Survey Procedures

Faculty were asked to keep daily records of the time they spent in 12 types of professional activities during an assigned 7-day period, and to complete the entries for each day of the period—workdays, weekends, and school vacation periods.

The survey responses were weighted to represent the activities of faculty nationwide by field, type of institution, and rank. The weighting also adjusted for nonresponse. The survey had an effective (or weighted) response rate of 67 percent in doctorate-granting institutions.

Fields surveyed are listed below:

- Engineering
  - Aeronautical and astronautical engineering
  - Chemical engineering
  - Civil engineering
  - Electrical engineering
  - Mechanical engineering
  - Other engineering
- Earth, environmental, and marine sciences
- Life sciences
  - Agricultural science
  - Biological science
- Mathematical sciences
  - Computer science
  - Mathematics
- Physical sciences
  - Chemistry
  - Physics
  - Astronomy
  - Other physical sciences
- Psychology
- Social sciences
  - Economics
  - Political science
  - Sociology
  - Other social sciences

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